CLAIMS

1. A two-dimensional photonic crystal formed by a periodical two-dimensional arrangement of plural unit lattices, comprising:

a prism-shaped first dielectric area arranged at each lattice point of the unit lattice;

a prism-shaped second dielectric area arranged at an approximate center of the unit lattice; and

a third dielectric area adjacent to and around the first and second dielectric areas.

2. A two-dimensional photonic crystal according to claim 1, characterized in that the third dielectric area has a relative dielectric constant different from relative dielectric constants of the first and second dielectric areas.

3. A two-dimensional photonic crystal according to claim 2, characterized in that the unit lattice is a tetragonal lattice.

4. A two-dimensional photonic crystal according to claim 3, characterized in that the first dielectric area and the second dielectric area have a substantially cylindrical shape and satisfy a relationship:

$$0.4a \leq r1 + r2 \leq 0.6a$$

wherein r1 indicates a radius of the cylindrical first dielectric area, r2 indicates a radius of the cylindrical second dielectric area, and a indicates a unit length of a lattice axis of the tetragonal lattice.

5. A two-dimensional photonic crystal according to claim 3, characterized in that a relative dielectric constant $\varepsilon 1$ of the first dielectric area is equal to a relative dielectric constant $\varepsilon 2$ of the second dielectric area.

6. A two-dimensional photonic crystal according to claim 3, characterized in that a relative dielectric constant $\varepsilon 1$ of the first dielectric area is smaller than a relative dielectric constant $\varepsilon 2$ of the second dielectric area.

7. A two-dimensional photonic crystal according to any one of claims 2 to 5, characterized in that a relative dielectric constant $\varepsilon 3$ of the third dielectric area satisfies at least a relation $\varepsilon 3 > \varepsilon 1$.

8. A two-dimensional photonic crystal according to claim 2, characterized in that a relative dielectric constant $\varepsilon 1$ of the first dielectric area, a relative dielectric constant $\varepsilon 2$ of the second dielectric area, and a relative dielectric constant $\varepsilon 3$ of the third dielectric area satisfy relations:

$$\varepsilon 3 > \varepsilon 1, \text{ and } \varepsilon 2/\varepsilon 1 > 20.$$

9. A two-dimensional photonic crystal according to any one of claims 1 to 4, characterized in that the first and second dielectric areas are formed by air and the third dielectric area is formed by a dielectric material containing a ceramic material.

10. A two-dimensional photonic crystal according to any one of claims 1 to 6, characterized in that the first and second dielectric areas are formed by a dielectric material containing a ceramic material and the third dielectric area is formed by air.

11. A two-dimensional photonic crystal according to any one of claims 1 to 8, characterized in that the first, second and third dielectric areas are formed by a dielectric material containing a ceramic material.

12. A two-dimensional photonic crystal according to any one of claims 1 to 11, characterized in that a unit length a of the lattice axis of the tetragonal lattice is different depending on a frequency of a light or an electromagnetic wave entering the two-dimensional photonic crystal.

13. A photonic crystal waveguide characterized in including a two-dimensional photonic crystal according to any of claims 1 to 12, wherein a linear defect is formed in a periodical lattice arrangement of the two-dimensional photonic crystal.

14. A photonic crystal resonator characterized in including a two-dimensional photonic crystal according to any of claims 1 to 12, wherein a point-shaped defect is formed in a periodical lattice arrangement of the two-dimensional photonic crystal.